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Five-Factor Model of Schizophrenia

Initial Validation

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Schizophrenic psychopathology is heterogeneous and multidimensional. Various strategies have been developed over the past several years to assess and measure more accurately discrete domains of psychopathology. One of the more fruitful strategies to investigate more homogenous domains of psychopathology has been the positive-negative syndrome approach. However, this approach is unable to address a number of important issues. Most schizophrenics present a mixed syndrome; the criteria for what constitutes a positive and negative syndrome are variable; distinguishing primary from secondary negative symptoms can be difficult. In order to address some of these problems, we propose the introduction of a five-syndrome model based on a reanalysis of factor analytic procedures used on 240 schizophrenics assessed with the Positive and Negative Syndrome Scale. We present data on a five-factor solution that appears to best fit the psychopathological data and that is supported by three independent and comparable factor analyses; negative, positive, excitement, cognitive, and depression/anxiety domains of psychopathology give patients their individual mark. Data on internal consistency of the five factors and on initial validation using demographic and clinical variables are presented.

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It has long been recognized that schizophrenic psychopathology is heterogenous and multidimensional. Various strategies have been developed over the past several years to assess and measure more accurately discrete domains of psychopathology. One of the more fruitful strategies has been the positive and negative syndrome approach reintroduced by Strauss et al. (1974) and expanded upon by Crow (1980) as type I and type II schizophrenia. This comprehensive hypothesis stimulated a large body of research attempting to validate this concept (for review, see McGlashan and Fenton, 1992). However, this two-syndrome model has been faced with a number of problems over the years.

In operationalizing positive and negative syndromes, most authors include a number of similar items. However, they also differ in the items they include to describe these two syndromes. This makes it somewhat unclear what a generally accepted presentation of a positive and negative syndrome is. When these syndromal descriptions are retained in a typological and/or dichotomous fashion (Andreasen and Olsen 1982; Crow, 1980; Kay et al., 1987; Lindenmayer et al., 1984), few patients can be classified as pure negative or pure positive. Most patients show both kinds of symptoms to various degrees concomitantly. Other problems include issues of temporal endurance (Carpenter et al., 1988), of secondary negative symptoms, such as depression and drug-induced akinesia, and of schizophrenic cognitive impairment, which this concept does not address appropriately. It appears that a two-factor model may be overly simplistic and too general an approach.

Furthermore, as factor analytic studies of patient samples assessed with existing positive-negative syndrome scales were carried out, it became apparent that a two-factor model was insufficient to explain the majority of the total psychopathological variance (Arndt et al., 1991; Bilder et al., 1985; Kay and Sevy, 1990; Liddle, 1987). In addition, the internal consistency of the positive syndrome appeared low, which led some of these authors to replace it by other factors, yielding a three-factor model with higher internal consistency: a delusion/hallucination dimension, a disorganization dimension, and a modified negative syndrome (Arndt et al., 1991; Bilder et al., 1985; Gur et al., 1991). Our own initial factor analysis has yielded a four-factor model consisting of a negative, hallucination-delusion (positive), excitement, and depression syndrome (Kay and Sevy, 1990).

Factor analytic approaches can identify discrete domains of schizophrenic psychopathology that contribute to the overall psychopathological expression. They

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may also clarify the specific constituent symptoms of those discrete domains of psychopathology. In this article, we present a reanalysis of our original factor analysis using the scree plot to serve as a guide to the appropriate number of factors, with interpretation and meaningfulness as important criteria (Rummel, 1970). We then examine the question of how consistent the resulting five-factor model is across different patient samples. The third question we examine is whether this new model can be validated independently.

Methods

Subjects

Subjects were 240 schizophrenic inpatients selected from hospital settings in New York City, mainly within a state psychiatric center. After initial screening for a chart-based diagnosis of schizophrenia and after an independent interview by a research psychiatrist, only patients with DSM-III criteria for schizophrenia (American Psychiatric Association, 1980) were retained. Those with major affective illness, schizoaffective disorder, organic brain syndrome, mental retardation, or any additional axis I diagnosis were specifically excluded from the study. This sample, gathered over the course of 7 years, had been recruited for purposes of research and training and included patients in both acute and chronic phases of illness who provided informed consent. The sample was predominantly male (N = 179; 74.6%) with an age range of 18 to 68 years (median, 31 years). The duration of illness since first psychiatric hospitalization was between 1 month and 42 years (range, 0 to 42 years; median, 9 years). Median age of onset of illness was 21 years and the majority of patients showed a gradual onset of symptoms. From the total of 240 subjects, 44.2% were black, 25.0% were white, 30.0% were of Hispanic origin, and 1.0% were Asian. All but two patients were on neuroleptic treatment at the time of study, and all were experiencing a significant array of psychotic symptoms.

Measures

All 240 patients were administered the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987), which was performed by consensus of one to three psychiatrists trained on the PANSS after the specified 35– to 40-minute interview. The PANSS provides a standardized method of assessing 30 psychiatric symptoms using operationally defined 7-point scales. The interrater reliability (Pearson r) on subsets of this sample ranged from .81 to .89 for the component scales (Kay et al., 1987).

Historical data were obtained from medical records, as well as from patient, staff, and family interviews. Age, sex, number of years ill, years of education, and the presence or absence of a documented history of psychiatric illness within the family were included in the present analyses. To this end, psychiatric admissions for schizophrenia, affective disorder, or unspecified mental illness in the patients' first-degree relatives were included.

Design

Previously, Kay and Sevy (1990) performed a principal components analysis with equamax rotation on the PANSS items for this particular sample that disclosed seven components with eigenvalues > 1 that could account for 64.7% of the total variance. Of these seven components, four embraced a substantial set of symptoms (five or more) and had eigenvalues > 2. The other three components together included only five symptoms. These symptoms had equal loadings on all three factors. Kay and Sevy held that these latter components described error variance, or factors of minor influence, and retained, therefore, only the first four factors (negative, positive, excitement, and depression). In contrast to other positive and negative symptom scales, the PANSS was specifically constructed to assess schizophrenic symptoms reflecting positive and negative domains and general psychopathological symptoms that could not be assigned to these two domains and that reflect the overall severity of illness and the complete spectrum of possible psychopathology. Therefore, it was expected that positive and negative factors would emerge along side more unspecific factors, which would give the individual mark to specific patient samples and also reflect the extensiveness of pathology.

In the current factor analytic study, the scree plot was used as one criterion for determining the appropriate number of factors. The most recent suggested use of the scree plot involves retaining the number of factors immediately before the straight line formed by the bottom of the roots, or eigenvalues, begins (Gorsuch, 1983); this procedure resulted in retention of five factors for the current data. A computer program to determine the correct number of factors developed by Coovert and McNelis (1988) was also used, suggesting a slope break between four and five factors. The next break was between factors seven and eight, which yielded factors that were difficult to interpret. This solution was, therefore, not retained.

We reanalyzed the data from our 240-patient sample using orthogonal rotation of five factors. We used orthogonal rotation because it is generally easier to interpret and to report. It was thought to be preferable because factors scores were used as variables in further analyses (Tabachnick and Fidell, 1989). After rotation, only the highly loading items for each factor were retained. Those items that were not purely loading items were dropped, with the exception of several items that

loaded .60 or above on one factor and .30 to .40 on a second. These items were retained in the factor on which they loaded highest. In addition, for one item (G11) which loaded .46 on factor I and .59 on factor III, a theoretical decision was made to assign it to the cognitive factor (III). We hoped that by utilizing these procedures, we would obtain more internally consistent factors, as defined by Cronbach's alpha. In addition, we found that our canonical analysis yielded clearer and significant results when we used the five components without the deleted items. Correlations of our component scores with the corresponding component scores which included the deleted items ranged from .99 to .97 ($p < .001$).

Our results are compared with previously published reports of two factor analyses obtained with the PANSS (Bell et al., 1992; Lépine et al., 1989) and with a factor analysis that we conducted on a large inpatient sample (Lindenmayer et al., 1994).

A canonical correlation analysis was undertaken to determine whether these five factors related to the available demographic and historical variables, in order to examine external validation of this model.

Results

Factor Analysis

The five-factor principal components analysis retained five components with eigenvalues > 1 and accounted for 57.5% of the variance (Table 1). The findings confirmed the presence of unrelated negative and positive syndromes as well as an excitement and depression/anxiety component. A clearly distinct cognitive factor emerged as component 3.

Examination of the factor loadings for each PANSS item disclosed a number of items that loaded equally on more than one factor. These items, which were subsequently dropped from further analyses, included stereotyped thinking, uncooperativeness, lack of judgment and insight, motor retardation, disturbance of volition, and hallucinations. The mean subscale score of the positive component was 3.24 (with a possible range from 1 to 7), 2.90 for the negative component, 2.75 for the cognitive component, 2.43 for the depression/anxiety component, and 2.25 for the excitement component. While patients tended to score highest on the positive component items, there was no significant difference in mean subscale scores among any of the components.

Reliability of Five-Component Model

Internal consistency for each of the components was determined by coefficient alpha. The negative ($\alpha = .86$), excitement ($\alpha = .76$), cognitive ($\alpha = .79$), positive ($\alpha = .80$), and depression components ($\alpha = .69$) all showed evidence of good reliability.

Validity of the Five-Factor Model

To test the validity of the five components, canonical correlation was utilized to investigate the relationships of the components to several independent demographic variables.

The original sample consisted of 240 individuals, but elimination of list-wise missing values and of one outlying case on the education variable resulted in a sample size of 231. The five component scores served as the first set of variables and sex, number of years ill, age, years of education, and family history of psychosis served as the second set. Assumptions regarding normality and within-set multicollinearity were met.

The first canonical correlation was .50, indicating a 25.0% (χ [25] = 62.16, $p = .0001$) overlap between the first pair of canonical variates. Subsequent chi-square tests revealed one other significant pairing (χ [16] = 29.25, $p = .02$), with a canonical correlation equal to .39, indicating a 15.5% overlap. Thus, there were two statistically significant linkages between the two sets of variables.

Analysis of the two statistically significant pairs of canonical variates appears in Table 2. With a cutoff correlation of .30 as the criterion for interpretation, the variables relevant to the first canonical variate in the component scores set in order of magnitude were the cognitive component score (loading of .55) and the positive component score (−.43). Variables available for interpretation in the second set in order of magnitude were education (−.69), family history of psychiatric illness (.47) and number of years ill (.45). Thus, patients with more cognitive dysfunction and less evidence of a positive component also tended to have less education, an increased incidence of documented family history of psychiatric illness, and a greater number of years ill.

The variables relevant to the second canonical variate in the component scores set in order of magnitude were the depression/anxiety component score (loading of .81), the positive score (.48), and the negative component (−.41). Variables available for interpretation in the demographic set in order of magnitude were education (.69) and age (−.31). Thus, patients with more depression/anxiety, a higher positive component, and a lower negative component also tended to have more education and a younger age.

Comparison with Other PANSS-Derived Factor Analyses

Comparison with a mostly outpatient schizophrenic population. Bell et al. (1992) studied a population of 110 mostly outpatient schizophrenics ($N = 70$)

TABLE 1
Component Loadings: Five-Factor Model of Schizophrenic Symptoms

	Equamax-Rotated Component Loadings						
	1	2	3	4	5	Eigenvalue	Variance
1. Negative Component							
N2[a] Emotional withdrawal	.81	*[b]	*	*	*		
N4 Passive/apathetic withdrawal	.76	*	.25	*	*		
N6 Lack of spontaneity		.76	*	*	−.21		
N3 Poor rapport	.69	.32	*	*	−.22		
N1 Blunted affect	.68	−.26	.30	*	*		
G16 Active social avoidance	.61	.33	*	.27	*		
						7.08	23.7%
2. Excitement Component							
P4 Excitement	*	.76	.22	*	*		
G14 Poor impulse control	*	.70	.27	*	*		
P7 Hostility	*	.67	*	.29	*		
G4 Tension	*	.61	*	*	.39		
						3.74	12.5%
3. Cognitive Component							
P2 Conceptual disorganization	*	*	.72	.37	*		
G10 Disorientation	*	*	.67	*	*		
N5 Difficulty in abstract thinking	.25	*	.65	*	*		
G5 Mannerisms and posturing	*	*	.63	*	*		
G11 Poor attention	.43	.24	.59	*	*		
						2.55	8.5%
4. Positive Component							
P1 Delusions	*	*	*	.85	.21		
G9 Unusual thought content	*	*	.24	.80	*		
P5 Grandiosity	*	*	*	.73	*		
P6 Suspiciousness/persecution	*	.39	*	.62	*		
						2.32	7.7%
5. Depression/Anxiety Component							
G2 Anxiety	*	.30	*	*	.71		
G3 Guilt Feelings	*	*	*	*	.63		
G6 Depression	*	*	*	*	.63		
G1 Somatic concern	*	*	*	*	.59		
G15 Preoccupation	*	.25	.26	.26	.52		
						1.56	5.2%
Other PANSS Items							
P3 Hallucinations	*	*	.37	.44	.34		
N7 Stereotyped thinking	*	.41	.29	.31	.29		
G7 Motor retardation	.55	−.38	*	*	*		
G8 Uncooperativeness	.51	.59	*	*	*		
G11 Lack of judgment and insight	*	*	.43	.48	−.31		
G13 Disturbance of volition	.34	.26	.40	*	.31		

[a] Original PANSS item number.
[b] Asterisk indicates component loading ≤ .20.

using the PANSS (mean age, 33; mean length of illness, 10.7 years; 95% male). These authors conducted a principal components factor analysis with equamax rotation. As in our present analysis, they found five factors explaining 52.03% of the total variance. In terms of item loading, the key differences are as follows (see Table 3). Their negative component contains preoccupation and disturbance of volition, while our negative component contains in addition poor rapport and active social avoidance. The cognitive component in the comparison study does not contain disorientation, while it does show lack of judgment and insight. Our positive component contains grandiosity, but not hallucinatory behavior or somatic concern. In our analysis, hallucinatory behavior was dropped because of its relatively low and equal loading on three components: positive, cognitive, and depression. If the same criterion had been used in the Bell et al. study, this item (.40) would have been dropped as well. Our depression/anxiety component does not contain motor retardation, as does Bell's study.

Comparison with a schizophrenic inpatient sample after a 1-week medication washout phase (Lindenmayer et al., 1994). We conducted a factor analysis on 517 DSM-III-R schizophrenic inpatients recruited for the purposes of a multicenter phase II drug study from

TABLE 2

Correlations, Standardized Canonical Coefficients, Canonical Correlations, and Percent Variance Between PANSS Component Scores and Demographic Variables and Their Corresponding Canonical Variates

	First canonical variate		Second canonical variate	
	Correlation	Coefficient	Correlation	Coefficient
PANSS Component Set				
Negative	−.21	−.68	−.41	−.52
Excitement	−.05	−.05	.23	.16
Cognitive	.55	1.03	−.11	−.03
Positive	−.43	−.65	.48	.26
Depression	.04	.19	.81	.76
	Percent of variance total = .25		*Percent of variance total = .16*	
Demographics Set				
Sex	.23	.89	.11	.47
Years ill	.45	.09	.11	.10
Age	−.04	−.07	−.31	−.09
Family psychiatric history	.47	.62	.06	.30
Education	−.69	−.17	.69	.25
Canonical Correlation	.50***		.39*	

* $p \leq .02$; *** $p < .001$.

facilities at 20 centers in the United States and six centers in Canada, including both university hospitals and psychiatric centers (median age, 37.9 years; median age of onset of illness, 22.1 years; mean number of hospitalizations, 8.8). After a 1-week drug-free period, all patients were assessed on the PANSS. Orthogonal factor analysis with equamax rotation was utilized, resulting again in a five-factor structure. The total variance explained was 56.2%, compared with 57.5% explained in our current sample. Item loadings of individual factors were closely comparable to our five-factor structure (see Table 3). The positive component came through as number 2, and the excitement component as number 4. The present sample additionally contained in the negative factor motor retardation. The positive component also additionally contained hallucinations. The excitement component did not include tension, but uncooperativeness was retained. The composition of the negative, cognitive, and depression components was almost equivalent in both studies.

Cross-cultural comparison with an inpatient schizophrenic sample. Lépine et al. (1989) subjected the PANSS scores of 331 medicated schizophrenic inpatients participating in a multicenter psychopharmacological trial to an orthogonal factor analysis using varimax rotation. The PANSS evaluations were conducted in French with the French version of the PANSS. Again, five factors were found, delineating a large part of the variance. The individual item loading was extremely close to our five-factor model (see Table 3). The negative factor contained in addition motor retardation, as was found in the washout sample. Difficulty in abstract thinking correlated equally with the negative and cognitive factors. Both cognitive and depression/anxiety factors were almost equivalent in both studies. In our own analysis, the positive factor includes grandiosity and suspiciousness/persecution, while the Lépine study did not.

Discussion

We have presented data in support of an enlarged five-factor model underlying the schizophrenic symptom structure as measured by the PANSS. Five independent factors have emerged: the negative, cognitive, positive, excitement, and depression/anxiety factors, which encompass 57.5% of the total variance. In addition, three independently conducted factor analyses are reviewed which find a very similar five-factor structure in different types of schizophrenic patient samples, supporting this model's generalizability. This replication and extension of our original findings (Kay and Sevy, 1990) strongly supports viewing schizophrenic psychopathology as consisting of several separate, but coexisting, domains of psychopathology.

The negative component is the most consistent and representative of these different domains, accounting for 23.7% of the total explained variance. This revised negative component contains five of the originally included symptoms, while stereotyped thinking did not load significantly. Difficulty in abstract thinking was also removed from the original negative component conception, since it loaded on a new cognitive factor. The high internal consistency as measured by Cronbach's alpha supports this revised negative factor, which is replicated in the reviewed factor analyses. It also supports a unitary structure of the negative syndrome as captured by the six negative items. All three replication analyses find the same core items (emotional withdrawal, passive/apathetic social withdrawal,

TABLE 3
Comparison of Revised PANSS Components to Previous Principal Components Analyses[a]

Revised PANSS 5-Factor Model	Outpatient/inpatient[b] (*N* = 110)	Adult inpatient[c] (*N* = 517)	Adult chronic[d] (*N* = 331)
1. Negative component	Factor 2	Factor 1	Factor 1
Emotional withdrawal	X[e]	X	X
Passive/apathetic withdrawal	X	X	X
Lack of spontaneity	X	X	X
Poor rapport	O	X	X
Blunted affect	X	X	X
Active social avoidance	O	X	X
(Disturbance of volition)[f]	X	O	X
(Preoccupation)	X	O	O
(Motor retardation)	O	O	X
2. Excitement Component	Factor 4	Factor 4	Factor 2
Excitement	X	X	X
Poor impulse control	X	X	X
Hostility	X	X	X
Tension	X	O	O
(Uncooperativeness)	X	X	X
(Lack of judgment and insight)	O	O	X
3. Cognitive Component	Factor 3	Factor 5	Factor 3
Conceptual disorganization	X	X	X
Disorientation	O	X	X
Difficulty in abstract thinking	X	X	X
Mannerisms and posturing	O	X	O
Poor attention	X	X	X
(Lack of judgment and insight)	X	O	O
4. Positive Component	Factor 1	Factor 2	Factor 5
Delusions	X	X	X
Unusual thought content	X	X	X
Grandiosity	X	X	O
Suspiciousness/persecution	X	X	O
(Somatic concern)	X	O	O
(Hallucinations)	X	X	X
(Stereotyped thinking)	O	X	O
5. Depression/Anxiety Component	Factor 4	Factor 3	Factor 4
Anxiety	X	X	X
Guilt feelings	X	X	X
Depression	X	X	X
Somatic concern	O	O	X
Preoccupation	O	O	O
(Motor retardation)	X	O	O
(Tension)	O	X	X

[a] All analyses utilized PCA with equamax, except Lépine (*varimax*) rotation.
[b] Bell et al., 1992.
[c] Lindenmayer et al., 1994.
[d] Lépine et al., 1989.
[e] X = retained in sample component; O = not retained in sample component.
[f] Items in parentheses were not contained in revised five-factor structure.

lack of spontaneity, poor rapport, active social avoidance, and blunted affect) loading on this factor in very diverse patient samples. The only difference is seen in two inpatient samples, which find in addition motor retardation, while in an outpatient sample, disturbance of volition is also found loading on the negative factor. The latter item, defined as avolition, loads consistently in factor analytic studies conducted with the Scale for the Assessment of Negative Symptoms on the negative factor and may therefore also constitute a genuine negative symptom. The composition of the Scale for the Assessment of Negative Symptoms negative factor (Arndt et al., 1991) and the Liddle (1987) factor of psychomotor poverty is very similar to that of our negative factor, supporting further the central position of this clinical syndrome in schizophrenia. Our negative factor is separate from depressive symptoms that were identified in all four studies as a separate domain of psychopathology. The ability of the PANSS to tease out these two potentially overlapping domains of psychopathology is clearly an advantage for both clinical as well as research purposes.

The excitement component contains some items that were previously assigned to the positive syndrome, pointing to the nonunitary nature of this latter syndrome as originally conceived. This new factor captures a behavioral activation dimension, as represented by items such as excitement, poor impulse control, and hostility. These same items were consistently found to load on this factor in all factor analyses. Pathophysiologically, the items loading on this factor might be mediated by dopaminergic hyperactivity and phenomenologically might be close to manic excitement.

Our third factor isolated an important cognitive impairment dimension within schizophrenic psychopathology, consisting of conceptual disorganization, disorientation, difficulty in abstract thinking, and poor attention. Clearly, this domain of psychopathology is separate from the negative syndrome, in contrast to Crow's formulation on the type II syndrome. It is in line with studies finding multiple neurocognitive impairments in schizophrenic patients (Goldberg et al., 1987; Mirsky, 1969). All replication studies found comparable item loadings on this factor, with conceptual disorganization and abstract thinking being found most consistently. This factor is comparable to Liddle's disorganization component and Arndt's third factor. Bilder et al. (1985) similarly found a disorganization factor, consisting of positive thought disorder, bizarre behavior, alogia, and attentional impairment, that was independent of their positive and negative factors. Interestingly, their factor also includes bizarre behavior reflecting disorganized behavior, which may be comparable to our mannerisms and posturing item. In addition, these authors found that neuropsychological deficits were most strongly associated with this disorganization factor, rather than with their negative factor.

Our positive component has been reduced from seven items to four, but now includes unusual thought content, which was originally classified as a symptom of general psychopathology. Hallucinatory behavior was deleted because of its low and mixed loading on more than one factor. Other replications have consistently retained hallucinatory behavior as part of the positive component. Upon close examination, these studies also find hallucinatory behavior to be loaded less discriminantly than unusual thought content and delusions. In the Bell study (1992), for example, hallucinatory behavior actually loads at only .40 and on several factors. This reflects the fact that hallucinations as defined by the PANSS relate to several syndromes and may therefore be relatively unspecific. If there are indeed specific schizophrenic hallucinations, which has been questioned by authors such as Taylor and Abrams (1973), then this points to the need for redefining this item, which then may yield a higher and more restrictive loading on the positive factor. In our inpatient sample, this component, usually regarded as one of the hallmarks of schizophrenia, in fact explains less total variance than the cognitive component. This restructured positive component is more internally reliable than our previous seven-item positive component (Kay et al., 1987). The modest amount of total variance explained may also be a result of the reduced number of items retained.

All principal component studies consistently elicited an independent depression/anxiety component consisting of anxiety, guilt, depression, and somatic concern as core symptoms. This finding is particularly noteworthy given the exclusion of schizoaffective subjects in all studies except that of Bell et al. (1992). In spite of significant affective impairment, as measured by the negative component, schizophrenics do experience symptoms of depression that can be identified separately. While this component may not be specific to schizophrenia, the amount of depression an individual patient actually experiences may represent a predictor for a more favorable course and may represent the degree of intactness of affective expression (Johnson, 1981; Pogue-Geile and Harrow, 1984; Vaillant, 1964). This aspect of psychopathology has been investigated further by our group (Lindenmayer et al., 1991), which found that 54% of our sample exhibited significant amounts of depression. Those high in depression tended to exhibit significantly higher positive symptoms. There was no particular association with negative symptoms, as compared with patients with low depression. Hence, depressed schizophrenics are not necessarily more deficit ridden.

In comparing our five factors to factors extracted from studies of the Brief Psychiatric Rating Scale (BPRS), it appears that four BPRS factors are close to four of our five PANSS factors. This overall close correspondence is due to the fact that the PANSS contains BPRS-derived items. The major discrepancy is found in the area of positive symptoms, which segregates in our model into three distinct syndromes (positive, excitement, and cognitive), while the BPRS only yields two discrete domains (thinking disturbance and hostile-suspiciousness). Our negative component, on the other hand, contains six items, reflecting the much broader assessment of negative symptoms by the PANSS.

Our initial attempts at validation of this five-factor model investigated the association of these factors with demographic and family history variables using canonical analysis. We found that the predominance of cognitive impairment was associated with a less florid clinical picture, a longer duration of illness, and a significant finding for history of psychiatric illness within the family. This association points to a particular genetic/famil-

ial variant of schizophrenia where cognitive impairment may be central, leading to early developmental changes and prolonged length of illness. This observation is similar to findings of an association of cognitive impairments and developmental failures with poor treatment response and more ominous course. In contrast, a second association was found between predominance of depression and positive symptoms and a smaller number of negative symptoms relating to higher education and younger age. This type of association may point to a prognostic variant where the clinical picture is characterized by relatively intact affect expression, more florid symptoms, fewer negative symptoms, and higher educational achievement due to less cognitive impairment. The good prognostic implication of depression has been reported in several follow-up studies (Pogue-Geile and Harrow, 1984). These findings are limited, however, by the fact that the two statistically significant sets of factors produced by the canonical correlation overlapped only 25% and 16%, respectively. This indicates that further research is needed to adequately account for symptom variability.

Further studies of specific correlates of these multiple and separate domains of psychopathology may help crystallize more clinically and etiologically meaningful schizophrenic subtypes. Such correlates may also provide more pathophysiological insights and discriminant treatment interventions.

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